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Electric Light & Power

THE NEWS MAGAZINE OF ELECTRIC UTILITY MANAGEMENT AND TECHNOLOGY

TOP 100 REPORT

Best System Heat Rates

Company	Heat rate Btu/kWh
1. Duke Power	9762
2. Commonwealth Energy	9810
3. United Illuminating	9909
4. American Electric Power	9951
5. South Carolina Electric & Gas	9970

Best Unit Heat Rates

Unit	Heat rate Btu/kWh
1. Marshall 3	9021
2. Belews Creek 2	9031
3. Marshall 1	9033
4. Marshall 4	9125
5. Campbell 3	9135

Generating systems and unit thermal efficiencies are featured in this year's report on operations at the 100 largest investor-owned utilities, beginning on page 7.

Few problems solved by bankruptcy

WASHINGTON, D.C.—Not only is the unthinkable becoming thinkable, but the possibility of electric utility bankruptcy appears to be increasingly likely. However, according to the Congressional Research Service of the Library of Congress, shareholders, customers, and utilities are not to be much benefitted, if at all, by a troubled electric company or its owners pressing for bankruptcy.

"The bankruptcy of a utility solves little aside from providing protection from creditors, and may create a number of problems on its own," writes Alvin Kaufman, author of *Utility Bankruptcy: Thinking the Unthinkable.*

Kaufman, who is senior specialist in the CRS's division of Minerals and Regulatory Economics, was aided by research assistant Donald Dulchinos.

The report notes that there are no precise precedents for analyzing utility bankruptcies. Although in the past certain railroads have been forced into bankruptcy, these carriers acted under special statutory considerations, requiring the Secretary of Transportation and state and local officials to become part of the proceedings.

Similarly, the airlines that have been forced into bankruptcy proceedings were able,unlike regulated electric utilities, to set rates as required; additionally, they were free to enter or withdraw from markets as competition dictated.

Yet, CRS analysts believe that by employing certain simplifying assumptions, they could fruitfully analyze a hypothetical utility bankruptcy in order to provide a first-pass look at whether such an action actually affords relief from financial and/or economic problems. CRS researchers concluded that, in the main, it did not.

Reorganization or liquidation?

The CRS report recalls that bank-

Continued on page 29

EEI will begin funding TMI-2 cleanup activities by January 1

BOSTON—The first of six annual payments to the Three Mile Island cleanup trust fund will be made by the Edison Electric Institute by January 1, 1985. The EEI board of directors announced its decision to begin payment even though its preset condition of $100-million in individual utility pledges has not been reached.

EEI announced the board's decision during its 52nd annual convention here in mid-June.

The EEI board in January 1983 had said that payments from a $150-million voluntary contribution program to aid in cleanup of General Public Utilities' TMI-2 nuclear plant would not begin until it had received utility pledges totaling $100-million. The threshold was established to ensure that sufficient funds would be available before payments began.

To date, EEI companies have pledged about $81-million. Slowness in reaching the $100-million threshold was attributed to state utility commissions' concerns about funding the cleanup and lack of agreement as to how contributions to aid such activities should be treated for ratemaking purposes.

Because the funds are needed by GPU to maintain progress on the cleanup, the EEI board voted to waive the requirement.

EEI President William McCollam, in announcing the board action, said "EEI remains firmly committed to this voluntary program, with a goal of raising $150-million toward the TMI cleanup."

A companion story, based on the presentation of Massachusetts Institute of Technology President Paul E. Gray, appears on page 34.

McCollam also reporterd to attendees that the general public's image of electric utilities and their services has improved overall since last year. Reporting on the April survey of nationwide public opinion conducted by Cambridge Reports, McCollam said "the good news seems to have gained on the bad news." The survey dealt with customer's opinions on the quality and reliability of their electric service, rates, the value of electricity, the industry's technological status and management quality and credibility. He also provided a summary of the Institute's activities during the previous year and outlined some new programs for the future.

Outgoing chairman Charles J. Dougherty predicted that a future shortage of electricity would entail high risks to national security and civil peace and pose "the most grevious danger for all to the nation." The so-

Continued on page 14

Coalition of consumer groups challenges CEA ad campaign

WASHINGTON, D.C.—The multimillion dollar advertising campaign being conducted by the U.S. Committee for Energy Awareness is "grossly inaccurate and misleading," and ought not to be charged to the nation's electricity ratepayers, an alliance of environmental and consumer advocate groups has charged.

According to James J. MacKenzie, senior staff scientist at the Union of Concerned Scientists, the ads "present a decidedly lopsided and often distorted view of both the status of nuclear power and the availability of alternative means for meeting our national energy needs."

A spokesman for CEA denied the charge, declaring that the advertisements are accurate and truthful and that the Safe Energy Communication Council (SECC) has merely been set up to "harass" the committee and to generate controversial publicity.

SECC, which a spokeswoman says was established to pool resources to counter the thrust of CEA advertisements, consists of many mainstream and well-known environmental and consumer advocate groups. These include the Sierra Club, Environmental Action Foundation, Critical Mass Energy Project, Environmental Policy Center, Media Access Project, Solar Lobby, Friends of the Earth, and the Union of Concerned Scientists.

Fairness at issue

According to UCS's MacKenzie, "The results of reading and accepting their [CEA's] message at face value would be a serious misunderstanding of national energy issues generally and the problems affecting nuclear power specifically."

For example, MacKenzie asserts in a May 1984 critical review of CEA's printed ads that the committee's advocacy of building new coal and nuclear plants rests on debatable asssumptions. "Two of these," he said, "are that continued economic growth requires concomitant increases in electricity consumption and that renewable energy sources cannot make a significant contribution to national electricity supply for many years."

MacKenzie maintains that a number of studies contradict these conclusions and demonstrate that there are less costly and less risky means of meeting U.S. electricity needs in the future.

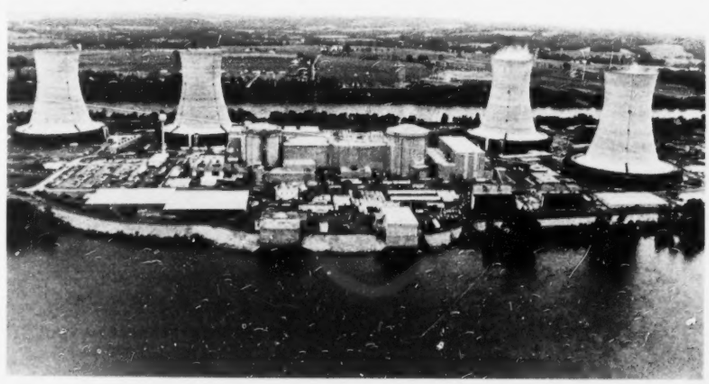
In his study, MacKenzie challenges what he sees as a rejection of alternative generating technologies in the CEA advertisements. He notes, for example, that photovoltaics are already beginning to be introduced for large-scale power production. Arco Solar, Inc. reportedly now is constructing a 16.5 megawatt facility to deliver power to Pacific Gas & Electric, with the first 5 MW already in place.

On a larger scale, the Sacramento Municipal Utility District (SMUD) has just dedicated the first phase of a 100-MW photovoltaic generating unit (see story, this issue, page 21).

"[F]ar from being only a glimmer in the eyes of renewable energy advocates, solar-powered electricity technology is being increasingly employed to meet utility needs," MacKenzie says. "Moreover, the downward cost trends are encouraging indicators that their use will continue to expand.

Conversely, DOE's forecast—cited in the ad—of about 180,000 megawatts of nuclear capacity by the turn of the century is totally unrealis-

Continued on page 3



Despite lagging pledges to its TMI-2 cleanup trust fund, EEI has announced it will begin funding part of GPU's on-going cleanup program, with the first payment to be made on or before January 1, 1985. TMI-2 is at right above, while TMI-1, awaiting start-up approval from NRC, is at left.

Foreign Power Briefs

• **Officials of Switzerland's** Kernkraftwerk Leibstadt AG said their 942 MW Leibstadt boiling water reactor plant has begun low power testing operations. The plant is the first in Europe to use the BWR/6 design by General Electric's nuclear operations. GE said the Leibstadt plant is the second nuclear unit of its design to operate in Switzerland. The first was the 320 MW Muhleberg BWR near Berne.

• **Korea Electric Power Company** dedicated the country's largest fossil-fired power plant in June. The two-unit coal-fired, 575 MW Samchonpo station provides nine percent of the utility's 13,000 MW capacity. Samchonpo supplies electricity for the heavily industrialized area around Pusan.

• **Approximately 79 percent of Canadians** have a generally favorable attitude towards their electric utilities, reports a recent CROP Report on public attitudes. The figure rose from 74 percent last year. When asked about the quality of electric service, 82 percent of the respondents said it was excellent or good. That was a 13 point plummet from the 90 plus level obtained in surveys from 1978 through 1983. The Canadian Electrical Association said the drop can be attributed to low ratings received in Montreal. Storms last winter resulted in blackouts that affected sections of the city.

• **China** said it has discovered more than 400 million tons of coal reserves in the southern Guangxi Zhuang autonomous region, which borders Vietnam. The official New China News Agency said the reserves were the largest found yet. The news agency said the coal will help to alleviate the region's reliance on coal shipped from mines north of the Yangtze River.

• **The Organization for Economic Cooperation and Development** (OECD) said the amount of nuclear electricity produced by the world's most industrialized countries rose approximately 12 percent last year to 806 billion kilowatthours. Nuclear electricity output grew eight percent in 1982. OECD said nuclear power production rose sharply last year in Canada, Belgium, France, Japan and the United States. France relies on nuclear power the most. OECD said that almost 49 percent of France's electricity comes from nuclear plants, up from 39 percent in 1982. Nuclear power provided 12.7 percent of the U.S.'s electricity production in 1983.

• **International Energy Agency** member countries are predicting an increase in coal demand to 1000 Mtoe in 1990 and 1350 Mtoe in 2000. Solid fuel use in IEA countries was approximately 850 Mtoe in 1980 and 1982. In a new report entitled *Coal Prospects and Policies in IEA Countries*, IEA said a major increase in coal production and use over the next two decades is essential to strengthen the energy security of IEA countries and to ensure that energy does not again become a constraint on economic growth.

• **Rolls Royce Limited** and the General Electric Company of the Ukraine (GEC) said they have formed a joint venture to supply gas turbine driven power generation equipment above 10 MW. GEC Rolls-Royce (Power Generation) Limited said it will operate out of Whetstone, England. A spokesman said the new company brings together the gas turbine and electrical engineering expertise of Rolls-Royce and GEC.

• **Poland** exported more than 23 million metric tons of coal this year, said P.A.P., the official Polish news agency. If the level of exports continue, P.A.P. says it will be a record year for coal sales abroad.

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EL&P readers whose responsibilities include both Generation and Transmission/Distribution receive both technology sections. Other readers receive the technology section that applies to their respective area of responsibility. The Generation edition is indicated by a single dot (•) in the upper right corner of page 1, the T/D edition carries two dots (••). All readers receive EL&P's industry news section.

Acid rain jeopardizes U.S. resources, says OTA

COSTS OF REDUCING SO_2 EMISSIONS IN THE EASTERN 31 STATES (EXCLUDES COSTS TO MEET CURRENT SIPS OR TO OFFSET FUTURE EMISSIONS GROWTH; ALL COSTS IN 1982 DOLLARS)

Emissions reduction (million tons SO_2)	If utility is required to choose most cost-effective control (Total cost) (billions of dollars/yr)	If utility is required to choose wet scrubbers[a] (Total cost) (billions of dollars)
4.6	$0.6-0.9	1.4
6.2	1.1-1.5	2.0
8.0	1.8-2.3	3.1
9.3	2.6-3.4	4.0
10.3	3.2-4.1	4.8
11.4	4.2-5.0	

(a) Assumes statewide emissions reductions are from those utility plants that can install scrubbers most cost affectively. Old and small units are exempt from the requirement to install scrubbers, but equivalent emissions reductions are obtained from other plants within each state.

Source: Office of Technology Assessment

WASHINGTON, D.C.—Our nation's resources are being endangered by acid rain, ozone and fine particles in the air, says a new report by the Congressional Office of Technology Assessment (OTA).

These air pollutants have harmed lakes and streams, lowered crop yields, damaged manmade materials, decreased visibility and may be threatening forests and human health, according to the report.

However, OTA said that controlling the pollutants will be extremely costly. OTA recommends that both sulfur dioxide and nitrogen oxides be considered for a nationwide control program.

If a modest sulfur dioxide control program—eliminating two to five million tons a year—were enacted, OTA said it would cost about $1 billion per year. A larger program to eliminate eight to 10 million tons a year would cost between $3 and $6 billion per year, said OTA.

The acid rain report was requested by Sen. Robert Stafford (R.VT), chairman of the Senate committee on environment and public works, Rep. John Dingell (D.MI), chairman of the committee on energy and commerce and Rep. Henry Waxman (D.CA), chairman of the subcommittee on health and environment of the committee on energy and commerce.

OTA is the nonpartisan research agency of Congress.

Source of problem

During 1980, approximately 27 million tons of sulfur dioxide and 21 million tons of nitrogen oxides were emitted in the nation. OTA said almost 80 percent of the sulfur dioxide and 65 percent of the nitrogen oxides come from the 31 states bordering on or east of the Mississippi River.

If energy-use patterns and current laws do not change, the congressional agency said both sulfur and nitrogen emissions will remain high for at least the next half-century—long enough to be significant to natural ecosystems.

Scientific uncertainties about acid rain continue to cloud the problem, said OTA. It said that additional scientific research will not provide an unambiguous answer in the near future, nor will it ever resolve value conflicts.

Time to act

Sen. Stafford said after reading the report that "the time to act is now, because to wait for the small chance that evidence will reverse course is to gamble America's heritage on an increasingly improbable outcome."

Rep. Dingell said the study shows there are still considerable uncertainties about the acid rain problem. However, the congressman said he is not opposed to reasonable and fair legislation that would deal with the problem in a national way.

Inaction risks damage

"This new report offers an invaluable source of information, indicating once more that continued inaction risks overwhelming damage to our nation's lakes and forests," said Rep. Waxman.

OTA said acid rain is high in most of the states east of the Mississippi, as far south as Tennessee and North Carolina. It estimates that there are about 3,000 lakes and 20,000 miles of streams, scattered throughout the eastern U.S., that are extremely vulnerable to acid rain or already are acidic.

Single greatest factor

Sulfate particles in the air are the single greatest factor in reducing the visibility in the eastern U.S., causing about half of the decrease in visibility annually and even more during the summer, said OTA.

Although research on the effects of airborne sulfates and other fine particles on human health are inconclusive, OTA said these pollutants may increase mortality rates.

The agency also said that ozone is causing about a 6 to 7 percent overall loss of U.S. agricultural productivity. Ozone is produced when nitrogen oxides interact with hydrocarbons.

If ozone were reduced to natural background levels, OTA said wheat and corn yields would increase by a few percent, soybean yields would rise 10 percent and peanut yields would go up by one fourth.

Tree growth drops

Another problem the report addressed is the declining tree productivity in the eastern part of the country and Europe. OTA said that over the past 20 to 30 years, productivity of several species of trees has declined in areas of high air pollution.

OTA said it believes that if a large emissions control program (8-10 million tons) were enacted, many sensitive aquatic resources would be protected. "Risk of damage to forests, agriculture, materials and health would likewise be reduced and visibility would improve," said OTA.

Electricity consumers would pay the most for a large cleanup, because approximately three-fourths of the sulfur dioxide emitted in the eastern U.S. comes from coal-fired plants. OTA estimates that if such a program were implemented, electricity rates would increase an average of two to five percent—rising as high as 10 to 15 percent in a few midwestern states.

NARUC's utility performance study scrutinized for usefulness

Don Minner
Assistant Editor

WASHINGTON, D.C.—Regulators and utility officials are closely examining a comprehensive study of electric utility financial and operating performance made by the National Association of Regulatory Utility Commissioners (NARUC) to determine its usefulness and value.

Author Michael Foley, NARUC director of financial analysis, said the report is an attempt to develop an objective means by which utilities can be compared over time to others in the industry.

The report compares financial performance, electricity price trends and operating performance of 130 major electric companies from 1972-1981.

Southern Indiana Gas & Electric was cited for the strongest financial performance over the 10-year period, while Western Massachusetts Electric had the weakest financial performance. Montana Power Company had the lowest residential rate increase from 1972-81, while the study said Hawaiian Electric Company had the highest rate increases.

The study found that Pennsylvania Power & Light had the highest improvement in productivity over the ten years, while Louisiana Power & Light had the lowest.

"Utilities are generally not wild about being ranked," said Foley. "A utility is always concerned when someone says "company A" is better than "company B"."

Edison Electric Institute Senior Vice President Douglas Bauer said, "Inevitably, anyone trying to rank utilities has to make some kind of judgement that will preordain the results." He said that it is unfortunate that people will probably leap to conclusions on the rankings and not take time to read through the report.

Bauer said intercompany comparisons are "a hazardous process at best."

Most people in the industry are wondering how the report will be viewed and used by regulators.

"I think it's (the study) a useful product," said Iowa Commerce Commission Chairman Andrew Varley, "perhaps not directly to commissioners, but definitely to the investment community. I think it's helpful to see where the utilities in your jurisdiction fit in with others."

Varley said he doesn't see how a regulator can use the report to help make a specific decision in a rate case. He said he feels the report will be useful in a general sense.

"If you find that one of your utilities is at the bottom of the range, you'd want to spend some time to see what's wrong," explained Varley. He said the NARUC study will help spot trends and trouble spots.

Both Foley and Varley said utilities at both ends of the rankings will probably get attention from regulators.

Foley says that a broad comparison is helpful. "I think it's important for everyone to get a handle on where the company stands in respect to others," he said.

Response to the report has generally been good. According to Foley, utilities, regulators and consultants are "scooping up copies."

The most common criticism of the report is its timeliness. Since so much has happened to the economy and the utility industry in the past two years, there is concern over the value of the statistics.

"If there is one fault of the report," said Varley, "it is the age of the information."

Foley said that many of the comments he has received have to do with the report's timeliness. Foley said that he worked for a year on building a data base and putting together the report. Now that it's finished, he said that he would like to get another report out this year that will be updated through 1983.

"I'm very willing to do the project on an annual basis," Foley said.

It seems likely he will get the opportunity. Varley, who serves as the chairman of NARUC's electricity committee, said he will invite Foley to make a report on the study at the next committee meeting. Varley said he also plans to recommend that it be done annually.

"I think it makes for a very interesting report," said the Iowa regulator.

Bauer said that EEI is still studying the report and will comment on it at a later date.

Foley said that officials from a number of utilities have told him that they often do intercompany comparisons. He said most of the callers are interested in the techniques used in the study. Varley said the Iowa Commerce Commission also is working on a similar type of study.

Varley said the report is the first time NARUC has been able to get a comprehensive study done without spending a large amount of money.

To rank the companies in order of performance, NARUC used 10 ratios. They included current ratio, AFUDC/net income, pre-tax interest coverage ratio, post-tax interest coverage ratio, cash coverage of common dividends, long-term debt ratio, interest and preferred dividend coverage, electric operating ratio, return on equity and return on investment.

In a statement accompanying the report, Foley said the ratios were picked to weight "the model in such a manner as to increase its sensitivity toward the measurement of the firms' cash position." Foley said this reflects his view that the most appropriate measures of electric utility financial position are those which emphasize cash flow.

He based the rankings on a financial performance percentage derived by taking the total number of "financial quality points" earned by the utility during the ten years as a percentage of 500 points. A utility could earn a total of 50 points each year.

Productivity was ranked by using a technique known as Total Factor Productivity (TFP), said Foley. He explained that TFP measures changes in the utility's output (kilowatthours) versus the inputs (labor, fuel, capital, etc.) used to produce power.

The NARUC report found that the average electric utility improved its TFP value by roughly one percent per year over the ten-year period. Of the 117 electric companies analyzed for the productivity section of the report NARUC said 83 had positive TFP changes and 34 utilities had negative changes.

Copies of the 229-page report can be obtained by sending $25 to NARUC, P.O. Box 684, Washington, D.C. 20044.

STRONGEST FINANCIAL PERFORMANCE (1972-1981)

Rank	Utility	Financial Performance Percentage
1	Southern Indiana Gas & Electric Co.	88.60%
2	Texas Electric Service Co.	86.80%
3	Wisconsin Electric Power Co.	86.00%
4	Texas Power & Light Co.	85.80%
5	West Texas Utilities Co.	84.40%

WEAKEST FINANCIAL PERFORMANCE (1972-1981)

Rank	Utility	Financial Performance Percentage
130	Western Massachusetts Electric Co.	31.60%
129	Alabama Power Co.	32.20%
128	Boston Edison Co.	32.80%
127	Detroit Edison Co.	32.80%
126	Kingsport Power Co.	37.20%

Source: National Association of Regulatory Commissioners

CEA ad campaign . . . from page 1

tic, ignores recent trends in cancellations, and indicates the agency's (and CEA's) overall bias toward large central, and preferably nuclear, power plants."

SECC petitions regulators

As part of its current campaign to thwart the advertising efforts of CEA, the Safe Energy Communication Council has petitioned each state regulatory commission to "examine closely any advertising costs submitted as operating expenses by electric utilties in rate proceedings."

The SECC request comes at a time when the National Association of Regulatory Utility Commissioners is conducting its own inquiry into how funds contributed by electric companies to various industry organizations are collected, spent, and recovered (see *EL&P*, February 1984, page 1; April 1984, page 1; and June 1984, page 2).

Arguing that the CEA campaign is intended to influence the public toward the side of nuclear power, the SECC letter to regulators encourages state commissioners to identify and disallow all expenses for CEA's and similar "self-serving campaigns."

The exact degree to which electric companies are expensing their contributions to CEA and other similar organizations has been difficult to determine. This is because individual regulatory jurisdications have different rules governing such expenditures and manifest varying levels of scrutiny over such matters.

For its part, CEA is unsure of how much is being charged to ratepayers, although it believes not many utilities currently are taking CEA contributions above the line.

"It's our impression that not many assign support of CEA to ratepayers," CEA director of public relations Carl Goldstein told *EL&P* in a telephone interview.

He said that out of a CEA membership of approximately 150 organizations, about half were electric utilities. Other members include suppliers, vendors, and consultants. According to Goldstein, however, electric utilities provide CEA with a disproportionately higher percentage of the committee's funds than its membership ratio suggests. Exact figures on this were unavailable.

CEA ads: 'truthful and accurate'

Contrary to the allegation of SECC, the Committee for Energy Awareness sees itself as providing a balanced view of the electricity supply and demand situation and of nuclear power.

"We are confident that what we are saying is truthful, and I know it is accurate . . .," Goldstein maintains. Noting that the current annual CEA budget of about $20 million is only about 1/50th of 1 percent of annual electric utility industry revenues, the CEA spokesman says the money goes "to provide a more rational climate" for weighing the issues of electricity demand and supply and thus correspondingly serves the public.

"We firmly believe that the money we are spending is in the interest of ratepayers and the U.S. public at large," Goldstein says.

In support of its declaration that what it prints and broadcasts is accurate, CEA's Goldstein notes that the three U.S. television networks require extensive documentation on the veracity of ads submitted for broadcast before they will air them. This is a rigorous and time-consuming process, Goldstein says, explaining that the networks do this in order that they not become excessively vulnerable to challenges, under the so-called Fairness Doctrine, by those who oppose the ads the networks accept for broadcast.

Seeking free air time under this doctrine, the SECC has challenged CEA commercials on all three networks but has been rebuffed, Goldstein says. "This is another indication," he offers, "that we are not playing fast and loose with the facts."

SECC spokeswoman Janet Bearden concedes that the networks so far have declined to provide free air time to the council in response to the nationally broadcast "Annie ad" CEA currently is running. The ad is so called because it draws from the broadway musical *Annie*.

But Bearden is quick to add that the final word is not in on SECC's free air time petition under the Fairness Doctrine and that there still are discussions going on between SECC and the networks. Noting that the networks, and ultimately the Federal Communications Commission, make the determinations on whether the CEA ads are sufficiently controversial to warrent the granting of air time for opposing views, Bearden says, "Absent an express FCC ruling, neither CEA nor the networks can properly claim the ads do not present controversial [material] of public importance."

"It is fair to say the match is not over," she adds.

Bearden also reports that while its challenge to CEA's high-cost network ad is still unresolved, SECC has been successful at local broadcast levels securing free air time in response to CEA ads. She estimates that to date this has amounted to about $280,000 in the aggregate.

Finally, CEA sees the SECC challenges to its media campaign as not, in fact, questioning the committee's truthfulness so much as disagreeing with CEA's vision of the future. The argument is, therefore, more philosophical than factual, CEA's Goldstein maintains.

The Top 100 electric utilities' 1983 operating performance

Robert Smock
Managing Editor

Peak demands soared upward at most of the 100 largest investor-owned electric utilities for the year 1983 due to the combination of a midwestern heat wave and economic recovery during the second half.

Indications of a resumption of strong demand growth stand out in this year's annual analysis of operating data taken from the 1983 Uniform Statistical reports of the top 100 IOUs. Raw data for each company is shown in the large tables on the next four pages and summaries for the top 100 as a whole are shown in the smaller tables.

The overall gain in peak demand of 4.2 percent is one of the largest in the past 10 years, exceeded only by the 5.4 percent of searingly hot 1980 and the 5.9 percent recorded in 1977, another year of economic recovery. The 1983 gain comes after a 1.8 percent decline in 1982, the first time that happened since *EL&P* began tracking the performance of the 100 largest investor-owned utilities.

Last year a whopping 82 utilities in the top 100 showed gains in peak demand, the same as in 1980. During the worst slump year, 1982, only 42 companies logged gains. The influence of the economic recovery on peaks can be seen in the list of the companies with the largest gains. Of the 14 companies with double-digit increases in 1983, 10 were from the industrial midwestern states:

- Southern Indiana Gas & Electric...+30.3 percent,
- Iowa Public Service...+15.7 percent,
- Southern Company...+15.0 percent,
- Montana Power...+13.5 percent,
- Louisville Gas & Electric...+13.4 percent,
- Portland General Electric...+13.3 percent,
- Wisconsin Power & Light...+12.1 percent,
- Cincinnati Gas & Electric...+12.0 percent,
- Wisconsin Electric Power...+11.3 percent,
- Commonwealth Edison...+11.1 percent,
- Detroit Edison...+10.5 percent,
- Puget Sound Power & Lt...+10.2 percent,
- Iowa Resources...+10.2 percent,
- Madison Gas & Electric...+10.1 percent,
- Cleveland Electric Illuminating...+10.1 percent.

The effect of the summer heat wave can be seen in the shifts from winter- to summer-peaking. In 1982 there were 32 winter-peakers. Last year there were only 19.

The overall 4.2 percent gain in peak was larger than the increase in energy demand during 1983, 2.2 percent for the top 100, because the economic recovery did not begin until the third quarter of '83. That was in time to push up summer peaks but only barely in time to cancel out the first-half declines in energy demand.

Evidence of the late-developing recovery can also be seen in the arithmetic average of company load factors which only increased slightly, to 57.7 percent. Load factor had dropped sharply in 1982, to 57.5 percent, from 1980 and 1981's 58.6 percent (which was down substantially from 1979's 60.0 percent.)

The strongly continuing economic recovery and signs of another hot summer indicate that 1984 might also show some large gains in electricity demand figures.

The fuel consumption data show a 3.9 percent gain in coal, driven by the 2.2 percent rise in energy demand. with consumption of oil and gas relatively flat. The oil consumption figure indicates that the rapid reduction in oil use over the past five years may be ended, and may even reverse.

Since 1978 the top 100 has cut oil consumption in half, with reductions of 18 percent in 1979 and 1980, 12 percent in 1981 and a whopping 31 percent in 1982. With a high probability of strong electricity demand for 1984 as a whole, and with the possibility of a coal strike looming in October, the oil consumption total could do an about-face. It is also interesting to note that the price of oil has dropped substantially over the past three years, in contrast to the price of gas which has risen sharply.

Many major oil consumers (more than one million barrels a year) continue to show large reductions from the previous year. The consumption-reduction leaders:

- San Diego Gas & Electric...-30 percent to 4.4 million barrels in 1983,
- Southern California Edison...-23 percent to 3.4 million,
- Tampa Electric...-21 percent to 2.4 million,
- Commonwealth Energy...-20 percent to 5.5 million,
- Orange & Rockland...-20 percent to 2.3 million,
- Commonwealth Edison...-20 percent to 5.8 million,
- Pacific Gas & Electric...-20 percent to 1.9 million,
- Virginia Electric & Power...-19 percent to 3.1 million,
- Florida Power...-14 percent to 9.2 million,
- Niagara Mohawk...-13 percent to 7.2 million,
- Eastern Utilities Associates...-11 percent to 3.4 million,
- Boston Edison...-10 percent to 10.4 million.

In the past few years this list has prominently featured utilities that converted oil-burning capacity to coal. This year the only large-scale converters on the list are VEPCO and Florida Power. The presence of the three big California utilities indicates 1983 was a good year for interchange of hydro electric energy.

On the other hand, there was an increase of oil consumption by utilities in the northeastern industrial states most strongly affected by the economic recovery. The list of leaders in increased oil consumption (among those consuming more than one million barrels a year):

- Texas Utilities...+215 percent to 2.2 million barrels,
- Philadelphia Electric...+103 percent to 8.7 million barrels,
- Pennsylvania Power & Light...+73 percent to 9.8 million barrels,
- Potomac Electric Power...+43 percent to 3.3 million barrels,
- Baltimore Gas & Electric...+24 percent to 3.1 million barrels,
- Central Hudson Gas & Electric...+20 percent to 6.4 million,
- General Public Utilities...+12 percent to 1.2 million,
- Atlantic City Electric...+10 percent to 2.3 million,
- Northeast Utilities ..+10 percent to 11.7 million barrels.

If these utilities are burning more oil in convertible capacity, pressure could grow, as it did in the mid 70's, to convert those plants back to coal. Oil consumption has been dropping for five years, but if it turns strongly upward in 1984 to help fuel the economic recovery, concern over oil consumption and pressure to reduce it from the government might reappear.

The top 100 fuel consumption data also show a definite end to the "gas bubble" practices of the late 70s and early 80s. The U.S. Dept. of Energy encouraged utilities to reduce oil consumption by burning natural gas in plants that could convert, and the federal officials made the conversion easy by diverting gas to those utilities. As a result, gas use climbed 12 percent in 1979 and 4 percent in 1980 while oil use plummeted 18 percent each year.

However, rising gas prices choked off the trend. The top 100 reduced gas use 16 percent in 1982 and another 2 percent last year. Consumption by the largest gas users:

- Houston Lighting & Power...-16 percent to 360 billion cubic ft,
- Texas Utilities...+2 percent to 312 billion,
- Central & Southwest...-9 percent to 280 billion,
- Gulf States...-6 percent to 233 billion,
- Middle South...-20 percent to 233 billion,
- Southern California Edison...-16 percent to 215 billion,
- Pacific Gas & Electric...-15 percent to 170 billion,
- Oklahoma Gas & Electric...+6 percent to 140 billion,
- Florida Power & Light...+3 percent to 113 billion.

Coal consumption showed a 3.9 percent gain in 1983. The gain came out of stockpiles, as coal industry production declined substantially in 1983. Utilities apparently decided to cope with the second-half surge in energy demand in a conservative way by reducing coal inventories, rather than increasing supply contracts, according to national data on coal consumption. That trend appears to have halted, with coal companies shipping at a furious rate in 1984 as utilities simultaneously try to meet the 8 percent growth in first-half 1984 energy demand and restore stocks to a strike hedge level by October.

Utilities with the largest gains in 1983 coal consumption (among those consuming more than 3 million tons a year):

- Florida Power...+74 percent to

TABLE 1
FOSSIL FUEL CONSUMPTION

	1982	Change	1983	Change
Coal (million tons)	461	–1.7%	479	+3.9%
Oil (million bbl)	227	–30.5%	228	+0.4%
Gas (billion cu ft)	2638	–16.3%	2586	–2.0%

TABLE 2
PEAK DEMAND AND RESERVE MARGINS

	1982	Change	1983	Change
Seasonal peak (MW)	363,164	–1.8%	378,465	+4.2%
Total system capability (MW)	466,943	+0.5%	474,238	+1.6%
System reserve margin	28.6%		25.3%	
Total owned capability (MW)	439,419	+1.5%	443,370	+0.9%
Owned reserve margin	21.0%		17.1%	
Average load factor	57.5		57.7	

HEAT RATES AND FUEL CONSUMPTION

Company	Rank	Heat Rate (Btu/kWh)	Up or Down	Fuel Consumption Coal (1000 tons)	Oil (1000 bbl)	Gas (1000 MCF)	Percent Change In Coal	Oil	Gas
Cincinnati Gas & Electric	6	10,009	D	7,101	769	112	+3	+13	–24
Detroit Edison	7	10,040	D	13,666	797	11,450	0	–56	+41
Consumers Power	8	10,054	D	5,933	255	228	+13	–18	–86
Dayton Power & Light	9	10,063	D	4,401	11	73	–9	–93	–75
Florida Power	10	10,082	D	3,768	9,195	6,808	+74	–14	–44
Illinois Power	16	10,181	D	7,423	170	572	+9	+70	+271
Boston Edison	17	10,217	U	0	10,355	15,262	0	–10	+94
New England Electric System	18	10,224	U	2,772	7,932	3,079	–1	–9	+277
Eastern Utilities Associates	19	10,232	U	262	3,445	0	–	–11	0
Houston Lighting & Power	20	10,263	U	8,531	227	360,030	+36	–60	–16
Florida Power & Light	26	10,372	D	0	34,696	112,782	0	+7	+3
Central & South West	27	10,380	U	11,513	517	279,961	+10	+92	–9
Hawaiian Electric	28	10,410	D	0	10,541	0	0	+2	0
Long Island Lighting	29	10,426	U	0	15,494	NA	–	+1	NA
Niagara Mohawk Power	30	10,433	U	3,191	7,230	19,689	–1	–13	–6
Louisville Gas & Electric	36	10,474	D	3,733	1	344	+8	0	+30
Carolina Power & Light	37	10,494	U	9,827	64	2,209	+3	–16	–
San Diego Gas & Electric	38	10,495	U	0	4,430	37,597	0	–30	+5
Indianapolis Power & Light	39	10,512	U	5,419	50	0	+10	+4	0
New York State Electric & Gas	40	10,552	D	4,667	1	0	–3	–97	0
Central Louisiana Electric	46	10,605	U	609	12	32,707	+15	–75	–24
Delmarva Power & Light	47	10,634	D	2,996	3,219	4,189	+50	–6	+3
Duquesne Light	48	10,635	D	4,205	99	0	–13	–8	0
Savannah Electric & Power	49	10,642	D	788	73	1,073	+8	–30	–23
Northeast Utilities	50	10,650	D	374	11,676	2,365	–7	+10	–29
Rochester Gas & Electric	56	10,746	D	833	644	169	+4	+6	–84
Virginia Electric & Power	57	10,761	D	7,387	2,573	3,051	+7	–19	+20
Southern Indiana Gas & Electric	58	10,770	D	1,984	1	374	+9	–93	+225
General Public Utilities	59	10,782	D	7,404	1,172	25,850	+3	+12	+30
Baltimore Gas & Electric	60	10,795	U	2,301	3,133	1,427	+23	+24	+132
Arizona Public Service	66	10,870	U	7,326	161	8,401	–1	+10	–19
Utah Power & Light	66	10,870	D	6,886	73	1,329	–4	+22	–56
Kansas City Power & Light	68	10,874	D	5,204	131	1,381	–1	+9	–46
Empire District Electric	69	10,887	D	1,135	19	491	+4	+90	+241
Wisconsin Public Service	70	10,902	D	3,003	338	220	+15	+745	+30
Wisconsin Electric Power	76	10,993	D	5,642	166	1,742	+12	+1	–45
Central Vermont Public Service	77	10,996	D	0	45	0	0	+25	0
Texas Utilities	78	10,997	D	29,350	2,186	311,847	–2	+215	+2
Iowa Resources	79	11,064	D	2,035	26	19	+10	+37	–92
Commonwealth Edison	80	11,076	D	16,913	5,760	7,401	+8	–20	+22
Portland General Electric	86	11,194	D	380	4	1	–27	+300	–97
Iowa-Illinois Gas & Electric	87	11,219	U	1,849	13	1,101	+9	–28	+25
Consolidated Edison	88	11,241	D	0	22,353	67,442	0	+5	–8
Interstate Power	89	11,248	D	2,111	25	1,122	+6	–7	+29
Public Service of New Mexico	90	11,296	NC	4,597	13	640	+27	–82	–82
Kansas Power & Light	96	11,628	U	5,504	88	4,665	+17	–59	–42
Otter Tail Power	97	11,840	U	1,891	3	0	–14	0	0
Central Telephone & Utilities	98	12,190	D	743	16	7,735	+47	–20	–19
Montana-Dakota Utilities	99	12,891	U	1,614	13	34	+9	+44	–48
Texas-New Mexico Power	100	17,221	U	0	3	27	0	–	–95

3.8 million tons,

- Middle South Utilities...+69 percent to 5.2 million,
- Delmarva Power & Light...+50 percent to 3 million,
- Houston Lighting & Power...+36 percent to 8.5 million,
- Public Service of New Mexico...+27 percent to 4.6 million,
- Southwestern Public Service...+21 percent to 4.3 million,
- Kansas Power & Light...+17 percent to 5.5 million,
- Wisconsin Public Service...+15 percent to 3 million,
- Wisconsin Power & Light...+14 percent to 3.2 million,
- Consumers Power...+13 percent to 5.9 million,

TABLE 3
TYPE OF GENERATION (MW)

Type	1982	Change	1983	Change
Conventional steam and combined cycle	339,714	+0.9%	338,646	–0.3%
Hydro and pumped storage	25,148	+7.4%	24,613	–2.1%
Gas turbines and internal combustion	36,940	+0.8%	37,488	+1.5%
Nuclear	43,131	–0.2%	46,604	+8.1%
Total	444,933	+1.2%	447,351	+0.5%

TABLE 4
TOP 20 GENERATING UNITS– BY HEAT RATE (CF > 50%)

	Unit	Capacity (MW)
1.	Marshall 3	630
2.	Belews Creek 2	1120
3.	Marshall 1	385
4.	Marshall 4	630
5.	Campbell 3	719
6.	Trenton Channel 9	500
7.	Belews Creek 1	1120
8.	Marshall 2	385
9.	Canal 1	568
10.	Morgantown 2	582
11.	Moss Landing 1	812
12.	Bay Shore 4	215
13.	McMeekin 1	126
14.	Bay Shore 1	136
15.	Karn 1	265
16.	Karn 2	265
17.	Lee 3	252
18.	Big Sandy 1	260
19.	Eastlake 5	446
20.	Milliken 2	154

- Northern Indiana Public Service...+13 percent to 5.1 million,
- Wisconsin Electric Power...+12 percent to 5.6 million.

Efficiency Improves

One of the more puzzling results in this year's top 100 data is a significant improvement in thermal efficiency.

In recent years about half the top 100 companies have shown improvements, half have recorded deterioration in heat rates, and the overall average has slowly increased.

That trend seemed to make sense with an aging fleet of power plants and the few new ones degrading overall heat rates since they were loaded down with efficiency-robbing pollution control equipment. Also, flat or declining capacity factors in response to weak energy demand tended to degrade heat rates.

There was a major turnaround in efficiency in 1983 which is difficult to explain with the modest increase in energy output. In 1983 an impressive 63 of the 100 largest investor-owned utilities logged reductions in heat rates. The median heat rate plunged to 10,650 Btu/kWh. That compares to 10,790 in 1982, 10,725 in 1981, and 10,655 in 1980.

The individual system heat rates are shown in the first large table. Changes in the top 10: Cincinnati Gas

Utility	Heat rate (Btu/kWh)
Duke Power	9021
Duke Power	9031
Duke Power	9033
Duke Power	9125
Consumers Power	9135
Detroit Edison	9140
Duke Power	9188
Duke Power	9214
Commonwealth Energy	9216
Potomac Electric Power	9250
Pacific Gas & Electric	9298
Toledo Edison	9321
South Carolina Electric & Gas	9351
Toledo Edison	9367
Consumers Power	9374
Consumers Power	9384
Carolina Power & Light	9389
American Electric Power	9397
Cleveland Electric Illuminating	9428
New York State Electric & Gas	9432

PEAK DEMAND AND CAPABILITY

Company	Season Peak MW	% Change	Winter (W) or Summer (S)	Total System Capacity MW (at time of peak)	Total System Reserve %	Owned Capacity MW (at time of peak)	Owned Reserve %	Load Factor %
Boston Edison	2,233	+2.4	S	2,809	26	2,716	22	59.0
Carolina Power & Light	6,622	+0.3	S	8,406	27	8,256	25	56.5
Central & South West	9,567	+4.5	S	12,285	28	12,167	27	55.3
Central Hudson Gas & Electric	663	−0.4	S	931	40	973	47	65.4
Central Illinois Light	983	+1.0	S	1,285	31	1,285	31	51.3
Cincinnati Gas & Electric	3,314	+12.0	S	4,030	22	4,030	22	55.5
Cleveland Electric Illuminating	3,404	+10.1	S	4,533	33	4,341	28	61.9
Commonwealth Edison	14,517	+11.1	S	16,850	16	15,856	9	52.7
Commonwealth Energy Systems	663	−0.3	S	859	30	225	−66	63.4
Consolidated Edison	7,388	+1.2	S	9,884	34	9,330	26	49.6
Duquesne Light	2,184	+1.2	S	3,088	41	3,063	40	61.3
Eastern Utilities Associates	700	+2.8	S	856	22	556	21	68.4
El Paso Electric	746	+0.3	S	988	32	988	32	61.8
Empire District Electric	536	+6.1	S	629	17	622	16	52.1
Florida Power & Light	10,676	−1.9	S	11,685	9	12,910	21	56.0
Idaho Power	2,091	−0.1	S	2,666	27	2,486	19	63.0
Illinois Power	3,215	+8.9	S	4,128	28	3,809	18	56.7
Indianapolis Power & Light	2,065	+7.3	S	2,528	22	2,528	22	54.9
Interstate Power	786	+3.4	S	904	15	902	15	60.0
Iowa Electric Light & Power	985	+7.1	S	1,200	22	999	1	53.4
Kansas Power & Light	1,853	+7.8	S	2,527	36	2,681	45	47.0
Kentucky Utilities	2,399	+3.0	S	2,676	12	2,610	9	53.5
Long Island Lighting	3,108	+2.1	S	NA	–	NA	–	NA
Louisville Gas & Electric	1,885	+13.4	S	2,438	29	2,438	29	49.4
Madison Gas & Electric	426	+10.1	S	594	39	594	39	51.4
Nevada Power	1,446	+1.8	S	1,962	36	1,750	21	48.9
New England Electric System	3,233	+2.0	S	4,197	30	3,902	21	61.2
New York State Electric & Gas	2,175	+4.0	W	2,779	28	1,799	17	64.4
Niagara Mohawk Power	5,625	+2.1	W	7,705	37	5,315	−6	66.4
Northeast Utilities	4,045	−0.1	S	5,928	47	6,252	55	64.3
Otter Tail Power	546	+2.6	W	647	18	595	9	57.7
Pacific Gas & Electric	13,243	+8.4	S	17,285	31	11,571	−13	61.7
Pacific Power & Light	4,380	+5.6	W	5,197	19	3,894	11	57.0
Pennsylvania Power & Light	4,869	+8.5	W	7,494	54	7,415	52	62.4
Philadelphia Electric	5,879	+3.3	S	7,503	28	7,503	28	57.4
Public Service of New Mexico	998	+4.3	S	1,479	48	1,479	48	64.6
Public Service Electric & Gas	7,244	+2.9	S	9,619	33	8,999	24	52.6
Puget Sound Power & Light	3,922	+10.2	W	3,676	−6	1,257	−68	43.1
Rochester Gas & Electric	1,037	+4.1	S	1,536	48	1,183	14	63.9
San Diego Gas & Electric	2,068	+1.1	S	2,677	29	2,577	25	34.6
Southern Indiana Gas & Electric	963	+30.3	S	1,012	5	1,012	5	50.1
Southwestern Public Service	2,581	+8.2	S	3,576	39	3,633	41	63.3
Tampa Electric	2,092	−7.4	W	2,578	23	2,578	23	60.8
Texas-New Mexico Power	NA	NA	NA	NA	NA	NA	NA	NA
Texas Utilities	14,029	+6.2	S	17,957	28	17,862	27	55.4
Virginia Electric & Power	9,404	+5.9	S	11,204	19	10,108	7	55.4
Washington Water Power	1,661	+6.7	W	1,804	9	1,389	16	48.8
Wisconsin Electric Power	3,555	+11.3	S	4,196	18	4,274	20	60.3
Wisconsin Power & Light	1,403	+12.1	S	1,822	30	1,637	17	61.3
Wisconsin Public Service	1,166	+5.9	S	1,683	44	1,671	43	72.6

TYPE OF GENERATION IN THE SYSTEM

Company	Fossil MW	Fossil %	Fossil Last Year Change MW	Hydro & Pump Storage MW	Hydro & Pump Storage %	Hydro & Pump Storage Last Year Change MW	Combustion Turbines MW	Combustion Turbines %	Combustion Turbines Last Year Change MW	Nuclear MW	Nuclear %	Nuclear Last Year Change MW
Boston Edison	1,797	65	–9	0	–	–	302	11	27	670	24	–
Carolina Power & Light	5,068	61	+587	214	3	–	1018	12	–	1955	24	–90
Central & South West	12,196	100	+136	0	–	–	0	–	–	0	–	–
Central Hudson Gas & Electric	893	92	+56	43	4	–2	38	4	–5	0	–	–
Central Illinois Light	1,255	98	+53	0	–	–	32	2	–	0	–	–
Cincinnati Gas & Electric	3,555	88	+6	0	–	–	475	12	–	0	–	–
Cleveland Electric Illuminating	3,527	81	–259	305	7	–25	62	1	–	447	10	–
Commonwealth Edison	9,653	55	–21	624	4	–	1331	8	–308	5929	34	+1078
Commonwealth Energy Systems	1,023	94	+2	0	–	–	62	6	–	0	–	–
Consolidated Edison	6,444	69	–126	0	–	–	2037	22	–13	849	9	–
Duquesne Light	2,457	78	+4	0	–	–	306	10	–	385	12	–
Eastern Utilities Associates	509	92	+2	0	–	–	47	8	–1	0	–	–
El Paso Electric	921	93	–1	0	–	–	69	7	–	0	–	–
Empire District Electric	412	66	–7	16	3	–	195	31	–	0	–	–
Florida Power & Light	8,186	63	–593	0	–	–	1977	15	–2	2823	22	+714
Idaho Power	858	33	–	1658	65	–17	50	2	–	0	–	–
Illinois Power	3,626	95	–	2	–	–	178	5	–	0	–	–
Indianapolis Power & Light	2,463	97	–	0	–	–	65	3	–	0	–	–
Interstate Power	870	94	+23	0	–	–	55	6	–	0	–	–
Iowa Electric Light & Power	481	49	–19	0	–	–	158	16	–	350	35	–
Kansas Power & Light	2,342	87	+369	0	–	–	339	13	–2	0	–	–
Kentucky Utilities	2,581	97	–14	24	1	–	59	2	–	0	–	–
Long Island Lighting	NA	–	–	NA	–	–	NA	–	–	NA	–	–
Louisville Gas & Electric	2,237	95	–105	0	–	–	109	5	1	0	–	–
Madison Gas & Electric	409	69	–3	0	–	–	92	15	+2	93	16	1
Nevada Power	1,312	75	+250	0	–	–	438	25	–30	0	–	–
New England Electric System	2,648	68	+17	1177	30	0	56	2	–75	0	–	–
New York State Electric & Gas	1,733	96	+2	56	3	+18	10	1	–	0	–	–
Niagara Mohawk Power	3,701	70	+33	694	13	+86	310	6	–	610	11	–
Northeast Utilities	2,485	43	–	1264	22	–	523	9	+22	1520	26	–9
Otter Tail Power	504	85	–19	5	1	+1	87	15	–15	0	–	–
Pacific Gas & Electric	8,275	74	–6	2507	22	+114	394	4	–	0	–	–
Pacific Power & Light	2,982	74	–	976	24	–	26	1	–	27	1	–
Pennsylvania Power & Light	5,685	78	–100	146	2	–	539	7	–	945	13	+945
Philadelphia Electric	3,389	43	–	1392	17	–	1362	17	+26	1816	23	–
Public Service of New Mexico	1,397	98	–56	0	–	–	28	2	+8	0	–	–
Public Service Electric & Gas	4,312	48	+4	165	2	–	2705	30	–	1817	20	–
Puget Sound Power & Light	508	40	–	310	24	–	455	36	–	0	–	–
Rochester Gas & Electric	605	53	+4	47	4	–	29	3	–	470	41	–
San Diego Gas & Electric	1,752	73	–191	0	–	–	333	14	–	301	13	+214
Southern Indiana Gas & Electric	879	87	+2	0	–	–	135	13	–	0	–	–
Southwestern Public Service	3,480	97	+32	0	–	–	106	3	+66	0	–	–
Tampa Electric	2,420	94	+40	0	–	–	158	6	–	0	–	–
Texas-New Mexico Power	39	78	–	0	–	–	11	22	–	0	–	–
Texas Utilities	17,856	100	–	0	–	–	6	–	–	0	–	–
Virginia Electric & Power	6,026	61	–119	326	3	–	439	4	–111	3112	31	–197
Washington Water Power	239	19	42	946	74	–946	101	8	–	0	–	–
Wisconsin Electric Power	2,725	68	+259	7	2	–68	288	7	–	990	25	–
Wisconsin Power & Light	1,195	74	–11	42	3	–	174	11	–4	214	13	+3
Wisconsin Public Service	1,237	73	–7	56	3	–	190	11	+3	214	13	+2

& Electric moved from 21st in 1982 (10,276) to 6th with a heat rate of 10,009; Consumers Power moved from 22nd (10,285) to 8th with 10,054; Dayton Power & Light moved from 20th (10,275) to 9th with 10,063; and Florida Power moved from 26th (10,383) to 10th with 10,082.

It should be noted that system heat rates are a measure of the efficiency of a company's entire thermal capacity. A company's rank is meaningful when compared to other companies with a similar fuel mix and generating characteristics or, more importantly, with its own position over time.

For example, it is not fair to compare a company burning low-rank coal loaded with ash and moisture with a company burning high-grade eastern bituminous coal. Likewise a company operating coal-fired plants grandfathered from federal pollution control requirements should not be compared to a company operating new capacity with sulfur dioxide scrubbers.

In that light, performances of companies further down the list can be impressive when put in perspective. For example, Missouri Public Service moved from 67th place in 1982 with a heat rate of 10,965 to 44th place in 1983 at 10,582. That's an efficiency improvement of almost 4 percent in one year, best among the top 100. Delmarva Power & Light moved from 70th at 11,004 to 47th with a heat rate of 10,634.

Table 5 shows a purer heat rate ranking. Unlike the system heat rate numbers in the large table, this rating eliminates the effect of gas turbines, internal combustion engines, and nuclear plants. It is based only on fossil-fired boilers, the capacity on which utilities concentrate efforts to improve efficiency. The list also shows an overall improvement in efficiency. A heat rate of 10,000 was barely good enough to make the top 10.

There are signs of a resurgence of interest in supercritical plants as a way to improve generating efficiency

TABLE 5
SYSTEM HEAT RATE LEADERS—FOSSIL-FUELED BOILERS ONLY

	Utility	Heat rate (Btu/kWh)
1.	Duke Power	9,343
2.	Consumers Power	9,674
3.	Commonwealth Energy	9,805
4.	American Electric Power	9,815
5.	United Illuminating	9,908
6.	Florida Power	9,953
7.	South Carolina Electric & Gas	9,962
8.	Cincinnati Gas & Electric	9,998
9.	Detroit Edison	10,031
10.	Toledo Edison	10,049

(see *EL&P*, July, page 32.) It is interesting to note that of the 144 supercritical units built by U.S. utilities, only 6 show up on a list of the 20 most efficient generating units shown on Table 4.

Not too impressive

If you remove the Duke Power units from the list, 4 supercritical (Belews Creeks 1 and 2, Marshall 3 and 4) and 2 subcritical, you're left with only 2 of the remaining 14 being supercritical. Since supercritical units were built to achieve high efficiency, that's not too impressive. It's

The most efficient generating units are largely small subcritical types.

interesting to note that the average size of the 14 non-Duke units is 380 MW. Modest size and high efficiency seem to go together.

Advocates of supercritical units argue that data put in proper perspective show that supercritical performance has been no worse than subcritical performance in terms of availabilty. However, efficiency data seem to show that supercritical units are no better than subcritical on that score.

Admittedly, the data reported here are sketchy and don't support a strong conclusion. What's needed is a comprehensive comparison of efficiencies of supercritical and subcritical units to eliminate age effects, pollution control equipment differences, and other extraneous factors.

Capability flat

Finally, the data on generating capacity shows a balance between retirements and new capacity. If it weren't for four new nuclear plants showing up in the top 100 data for the first time, the group's generating capacity would have declined for the first time since *EL&P* began tracking it. As it was, the nuclear additions barely canceled out losses in the other categories.

Utilities showing the largest reductions in conventional (non-nuclear) steam capacity were:

- Southern Calfornia Edison...-1128 MW,
- Florida Power & Light...-593 MW,
- Portland General Electric...-534 MW,
- Allegheny Power...-445 MW,
- Ohio Edison...-288 MW,
- Dayton Pwr & Lt...-195 MW.

TRANSMISSION AND DISTRIBUTION LINES IN OPERATION

	Transmission				Distribution							
					Overhead				Underground			
Company	189 kV & Up (circuit miles)	Miles Added	Below 189 kV (circuit miles)	Miles Added	22 kV & Up (pole miles)	Miles Added	Below 22 kV (pole miles)	Miles Added	22 kV & Up (cable miles)	Miles Added	Below 22 kV (cable miles)	Miles Added
Boston Edison	160	–	199	–	3,373*	4*	–	–	7,173*	89*	–	–
Carolina Power & Light	2,632	98	3,045	–18	36,240*	220*	–	–	2,604*	194*	–	–
Central & South West	1,113	–	14,224	383	237	28	53,137	2408	0	–	4,914	286
Central Hudson Gas & Electric	76	–	521	–82	44	–	6,263	47	0	–	665	7
Central Illinois Light	47	–1	286	–	628	1	5,635	–11	7	–	1,624	34
Cincinnati Gas & Electric	379	–1	1,377	–2	483	–1	8,903	22	21	1	1,598	56
Cleveland Electric Illuminating	359	103	1,997	–5	–	–	9,434*	15*	–	–	4,866*	113*
Commonwealth Edison	2,383	–	2,444	3	35,587*	18*	–	–	20,056*	303*	–	–
Commonwealth Energy Systems	293	0	60	0	1,414	51	3,279	–15	688	48	1,960	171
Consolidated Edison	410	81	22	–	354[▲]	7[▲]	25,696[▲]	–69[▲]	6,310	5	58,107	–37
Duquesne Light	132	–	511	–	392	6	6,103	35	392	32	2,032	49
Eastern Utilities Associates	75	–	289	–	65	–	3,335	–	6	–	851	–
El Paso Electric	462	1	654	–	1,271	–248	2,893	19	64	19	644	13
Empire District Electric	0	–	1,190	10	0	–	4,522	43	0	–	204	8
Florida Power & Light	2,494	78	2,235	–26	32,507*	677*	–	–	9,535*	534*	–	–
Idaho Power	1,451†	–22†	3,229†	–12†	3,911	135	13,055	–92	127	11	4,115	108
Illinois Power	485	36	2,357	22	1,331	–40	16,416	62	4	–	969	27
Indianapolis Power & Light	419	39	617	–	0	–	4,617	12	0	–	3,444	161
Interstate Power	69	–	2,615	–29	NA	–	NA	–	0	–	490	24
Iowa Electric Light & Power	67	–	3,232	–366	0	–	4,698	8	0	–	1,502	42
Kansas Power & Light	4,348*	–	–	–	12,162*	–	–	–	385*	–	–	–
Kentucky Utilities	433	–	4,119	–14	0	–	13,841	104	0	–	0	–
Long Island Lighting	NA	–	NA	–	NA	–	NA	–	NA	–	NA	–
Louisville Gas & Electric	131	–	758	121	87	–	3,249	13	–	–	1,719*	29*
Madison Gas & Electric	124	–	179	14	0	–	1,076	3	0	–	503	31
Nevada Power	613	32	458	7	0	–	2,616	26	0	–	2,378	163
New England Electric System	602	0	1,980	–14	785	1	16,046	–742	199	5	6,522	–254
New York State Electric & Gas	4,565*	–	–	–	32,017*	–	–	–	1,533*	–	–	–
Niagara Mohawk Power	1,116	–	8,134	–19	107,345*[▲]	92*[▲]	–	–	6,510*	92*	–	–
Northeast Utilities	2,065*	–	–	–	20,762*	85*	–	–	5,292*	144*	–	–
Otter Tail Power	369	75	5,029	–285	147	–18	927	209	21	17	1,349	–238
Pacific Gas & Electric	17,854*	–	–	–	81,794*	–	–	–	9,474*	–	–	–
Pacific Power & Light	3,226	–	3,847	–	27,685*	–919*	–	–	6,866*	–2748*	–	–
Pennsylvania Power & Light	1,312	–	0	–	2,348	9	46,529	293	10	–	6,026	2186
Philadelphia Electric	673	–	365	–27	61	4	11,674	10	17	–	14,633	368
Public Service of New Mexico	2,343*	–	–	–	4,329*	–	–	–	1,656*	–	–	–
Public Service Electric & Gas	680	–2	1,802	6	14*	–	–	–	109	–	19,492	753
Puget Sound Power & Light	336†	16†	1,447†	126†	12,430*	343*	–	–	4,358*	303*	–	–
Rochester Gas & Electric	0	–	701	–12	0	–	6,602	4	0	–	4,095	50
San Diego Gas & Electric	243	33	1,098	4	0	–	7,231	13	0	–	5,598	223
Southern Indiana Gas & Electric	0	–	804	–	0	–	3,176	5	0	–	619	37
Southwestern Public Service	5,122*	–	–	–	15,096*	–	–	–	847*	–	–	–
Tampa Electric	1,100*	–	–	–	6,345*	–	–	–	1,465*	–	–	–
Texas-New Mexico Power	20	–	1,551	13	–	–	7,805*	307*	–	–	307*	32*
Texas Utilities	3,650	189	8,669	8	2,638	157	47,015	311	770	104	6,436	350
Virginia Electric & Power	2,666	151	2,984	–30	38,039*	120*	–	–	11,073*	446*	–	–
Washington Water Power	545†	7†	1,477†	–39†	576	2	8,703	8	0	–	1,187	35
Wisconsin Electric Power	2,424*	–	–	–	22,131*	–	–	–	7475*	–	–	–
Wisconsin Power & Light	107	–	2,759	15	16,700*	51*	–	–	0	–	1,022	85
Wisconsin Public Service	124	–	1,569	–9	16,377*	62*	–	–	3,114*	184*	–	–

*Total—All voltage levels †Pole miles ▲Wire miles ●Conduit bank miles

Utilities aim at turning around the decline in nuclear plant performance

Robert Smock
Managing Editor

While headlines focus on the problems of nuclear plants under construction, utility attention is concentrating on the 80 nuclear generating units now operating.

They're getting attention because, on average, they're not operating nearly as well as they should be.

The clearest indicator of that is plant capacity factor. It's averaged 60 percent in the U.S. It should be close to 80 percent. Another indicator is availability, less than 70 percent. Even worse, both these indicators have been deteriorating over the past five years.

With the construction pipeline emptying, utilities operating nuclear plants will be able to concentrate efforts on turning around the decline in plant performance.

"Operational quality is the last frontier," Michael Tuckman, manager of Duke Power's Oconee nuclear station told a recent meeting of the Atomic Industrial Forum held to discuss positive experiences in the industry. A program at Oconee and one at Georgia Power's Plant Hatch to improve plant capacity factors were the most positive experiences explored at the meeting.

Tuckman said Oconee has been running at close to the national average of 60 percent capacity factor during its 10-year life. That kind of capacity factor, said Tuckman, is "mediocre." He said 80 percent should be the station's goal.

Georgia Power vice president for nuclear power Dick Conway told the AIF conference that his company's 8-year old Plant Hatch has operated with a capacity factor in the mid 50s and that the goal is to get it up to 75 to 80 percent within three years.

Higher CFs possible

The reason these utilities and others are trying to improve plant capacity factors rather than passively blaming their problems on outside influences beyond their control is that there is evidence that the effort will pay off.

Impressivly high capacity factors and availabilities are being achieved in the U.S., according to a presentation at the AIF meeting by consultant Thomas Keenan, vice president of Cygna Energy Services. While the lifetime capacity factor average for all U.S. plants is 63 percent, Keenan reported, the average for the 17 best plants is 75 percent. Likewise, the best 17 have logged an average plant availability of 80.6 percent compared to 68.6 percent for all U.S. plants.

The U.S. performance looks especially improvable when compared to performance by nuclear plants in other countries. One speaker at the AIF meeting presented a ranking of nuclear capacity factors by nation, reproduced in Figure 1. The U.S. ranks far down the list, outperformed even by developing countries such as South Korea and Taiwan. The top 6 nations have shown it's possible to achieve capacity factors at or near 80 percent.

Unfortunately, presentations by speakers from several European countries ranked above the U.S. on the list were not too illuminating. They've experienced the same problems as U.S. utilities—PWR steam generator corrosion, BWR pipe cracking, regulatory delays, etc.—but to a lesser degree. They seemed to have no magic formulas for solving the problems.

The striking features about most of the European nuclear programs are their small size, as shown in the cumulative energy production totals in Figure 1, and the centralized nature of their utility industries. Unfortunately, neither of these advantages, if they are advantages, are available to the U.S.

More interesting was a presentation from a Japanese speaker who outlined nuclear experience closer to that of the U.S. than most of the others. The Japanese have one of the largest nuclear programs outside of the U.S., with 24 units now in operation, mostly of U.S. design.

The capacity factor trend lines in Figure 2 show that in the past the Japanese had even more problems than U.S. utilities. Over the last five years, however, Japan has shown steady improvement while the U.S. plants have steadily deteriorated in performance.

The simple explanation is that the regulatory aftermath of the March, 1979 TMI incident negatively affected U.S. nuclear plants while the Japanese were free to move up the learning curve. That may be true, but the important lesson is that the Japanese experience illustrates it is possible to move up the learning curve and achieve significant improvements in

Continued on next page

Figure 1
Average nuclear plant capacity factors and electricity generation totals for Western nations through the end of 1983 show the U.S. is well down the list.

		Load Factor %	Total Electricity Generation TWh
1.	Switzerland	81.6	121
2.	Netherlands	81.1	40
3.	Finland	79.1	68
4.	Canada	79.0	351
5.	Belgium	78.6	118
6.	Argentina	77.5	23
7.	United Kingdom	69.8	647
8.	Spain	68.8	92
9.	Taiwan	68.5	60
10.	Fed. Rep. of Germany	64.3	439
11.	Sweden	64.2	242
12.	S-Korea	64.0	25
13.	France	61.5	616
14.	Japan	59.4	631
15.	USA	58.2	2756
16.	Yugoslavia	57.6	7
17.	Italy	56.3	70
18.	India	45.4	35
19.	Pakistan	25.0	4
Average of all reactors		62.3	

Source: "Swiss Experience in Nuclear Power Operation," Kueffer. International Conference on Positive Experience in Building and Operating Nuclear Power Plants. AIF Boston, May 1984

Georgia Power nuclear vp Richard Conway thinks significant capacity factor improvement is possible.

The capacity-factor goal for Georgia Power's Plant Hatch is 80 percent.

It can be done—some U.S. nuclear plants are already among the world's best performers.

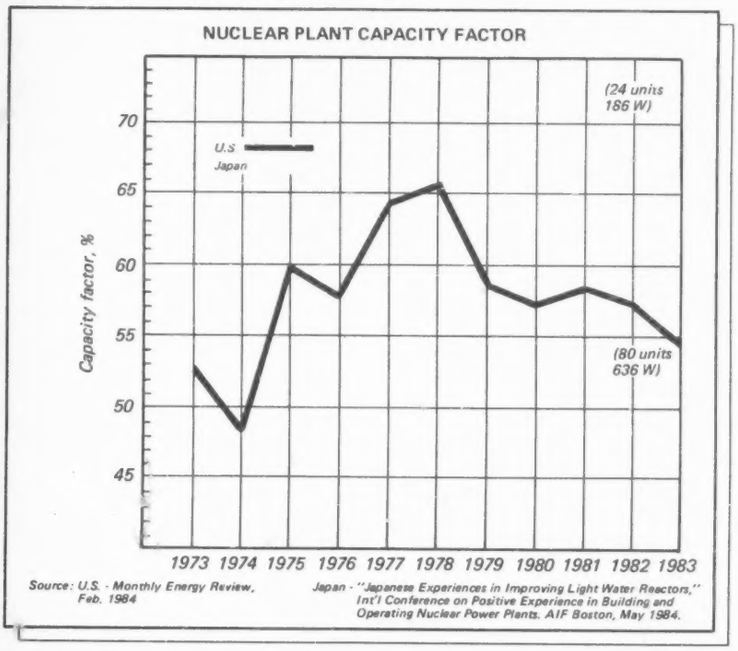
nuclear plant capacity factors in an operating environment that is similar to that of the U.S. in many ways.

Norio Suzuki, managing director of the Japan Atomic Power Co. said that, over the years, Japanese operators of nuclear plants have improved performance by getting past the generic steam generator and pipe crack problems, by introducing more homegrown technology, and, most importantly, by concentrating on reducing outage times.

The Japanese, particularly sensitive to nuclear facilities, require that each reactor be inspected by a government agency during its required annual shutdown, Suzuki explained. That led to extremely long outages in the past which ran as long as 6 months. Introduction of improved inspection and maintenance techniques has reduced the average to about 90 days. In addition, many plants are moving to extended operations, aiming at 13 months of operation followed by 3 months, or less, for the inspection outage. Achievement of an average capacity of 71.5 percent in 1983 with a three-month average for scheduled outages shows that the Japanese have done a good job of reducing forced outages.

Another indicator that it is possible to operate a nuclear plant in the U.S. at a capacity factor close to the best in the world is shown in Figure 3—some are already there.

The capacity-factor trendlines over the past 10 years for U.S. and Japanese nuclear plants shows a sharp divergence in direction since 1978.



Source: U.S. - Monthly Energy Review, Feb. 1984

Japan - "Japanese Experiences in Improving Light Water Reactors," Int'l Conference on Positive Experience in Building and Operating Nuclear Power Plants. AIF Boston, May 1984.

The best-performing nuclear units in the world include several from the U.S. These are cumulative capacity-factors through the end of 1983 for all units larger than 100 MW with more than three years of operation.

1.	Beznau-2	CH	PWR	364 MW	85.8% since Dec 1971
2.	Muehleberg	CH	BWR	336 MW	85.4% since Nov 1972
3.	Stade-1	FRG	PWR	662 MW	84.4% since May 1972
4.	Doel-1	B	PWR	412 MW	83.2% since Feb 1975
5.	Unterweser	FRG	PWR	1300 MW	82.8% since Dec 1979
6.	Goesgen	CH	PWR	970 MW	81.3% since Oct 1979
7.	Borssele-1	NL	PWR	481 MW	81.2% since Oct 1973
8.	Olkiluoto-1	FIN	BWR	683 MW	80.8% since Oct 1979
9.	Obrigheim	FRG	PWR	345 MW	80.4% since March 1969
10.	Point Beach-2	USA	PWR	524 MW	79.7% since Oct 1972
11.	Oskarshamn-2	S	BWR	615 MW	79.4% since Dec 1974
12.	Prairie Island-2	USA	PWR	547 MW	79.0% since Dec 1974
13.	Connecticut Yankee	USA	PWR	602 MW	79.0% since Jan 1968
14.	Barsebaeck-2	S	BWR	590 MW	77.8% since July 1977
15.	Calvert Cliffs-2	USA	PWR	880 MW	76.9% since March 1977
16.	Chinshan-2	TAI	BWR	636 MW	76.7% since July 1979
17.	Kewaunee	USA	PWR	560 MW	76.5% since June 1974
18.	Tihange-1	B	PWR	920 MW	75.8% since Oct 1975
19.	Beznau-1	CH	PWR	364 MW	75.4% since Dec 1969
20.	Loviisa-1	FIN	PWR	465 MW	75.3% since May 1972

Source: "Swiss Experience in Nuclear Plant Operation," Kueffer. International Conference on Positive Experience in Building and Operating Nuclear Power Plants. AIF Boston, May 1984

There's a plaque at Plant Hatch that says the station's goal is to be "the best nuclear power plant in the USA" and it's signed by all the station employees, reported Georgia Power vice president Dick Conway.

The utility defines "best" at least partially in terms of capacity factor. The goal is to get the plant into the 75 to 80 percent range. Plant Hatch, a twin unit BWR station with the first unit in operation for about 8 years, has logged a capacity factor in the mid 50's.

Right now the plant is in the middle of a recirculation piping replacement, a capacity-factor robbing project common to many BWRs. (Conway said there are 2100 people on site for the replacement job, more than were needed at the peak of plant construction.) Following completion of the replacement project, the capacity factor improvement effort will begin.

Conway said the company expects to get half the CF improvement through modifications of plant equipment. Changes in operating procedures will account for 10 percent of improvement and better maintenance practices will produce the rest.

Utility analysts looked at 200 potential sources of power losses and identified 128 potential improvements for Plant Hatch. The importance of the improvements was analyzed on the basis of contribution to plant performance and to regulatory compliance, each factor given equal weighting.

Contribution to regulatory compliance was measured by estimating factors such as reduction in number of violations, dollar value of fines, manrems of exposure, etc. Contribution to performance was measured by estimated increase in capacity factor, reduction in planned outage days, effect on heat rate, etc. In this manner the potential improvements were ranked. Now the capacity factor improvement program is focussing on the top 49 items, Conway said.

Some of the major modifications will be a cooling tower upgrade, relocation of the steam jet air ejectors, and rebuilding of the condensers.

Duke Power's program

Duke Power's Michael Tuckman explained that even though capacity factors at the three-unit Oconee station ran close to the U.S. average Duke was not very happy with that level of performance.

In 1982 Duke formed a nuclear production department separate from the fossil group. A manager of nuclear reliability assurance was appointed to report to the vice president in charge of nuclear production. The reliability assurance department identified the top 10 items contributing to unreliability at each unit and set up programs to solve the problems.

Tuckman explained that at his station, Oconee, 1982 saw low capacity factors because each of the three units was down for an average of 164 days for a 10-year inspection outage and major repairs.

Duke got the plant back in "first-class" condition, Tuckman reported, and operations since then have been excellent. Despite two refueling outages in 1983 the plant logged an overall capacity factor of 79 percent. So far in 1984 unit 1 and 2 are running at 99 percent CF and unit three at 84.

Tuckman identified these specific steps taken in the Oconee capacity-factor improvement program:

- Poor valve performance, the manager reported, was a major cause of reliability and thermal efficiency problems. An outside vendor was brought in to train mechanics and engineers and valve maintenance procedures were tightened up. Spare parts have been beefed up and bad performers were identified and replaced. In a typical outage in the past 200 valves were repaired said Tuckman, but during the long 1982 outage almost 500 were repaired at Unit 2 alone. In addition, 56 valves were replaced at the Oconee station.
- Since 1976 Oconee has experienced 23 steam generator tube leaks with each outage averaging 330 hours. The improvement program led to steps such as reducing stress on steam generators by taking more care during turbine stop-valve testing to reduce mechanical shock on the tubes and restricting low power operation. Coupled with tighter limits on water and steam chemistry, these steps have produced a significant improvement in steam generator operation. There have been no leaks in the past 17 months.

Modifications made

- There have been a number of equipment modifications such as changes in reactor coolant pump seals and motor lubrication that appear to have solved long-standing generic problems. The station is currently on its third generation of control rod drives and they seem to be performing well, Tuckman reported. The reactor building cooling system was upgraded because temperatures were as high as 140 to 150F, too high for maintenance workers. Temperature was dropped 30 degrees.
- Oconee has moved to a 440-day refueling cycle from a 270-day cycle for each unit. Management is looking at the possibility of a 520-day cycle.

One of the more interesting changes was the move to 12-hour rotating shifts in January of 1983. Tuckman feels that the 12-hour shift results in fewer operator errors because there are fewer shift changeovers, overtime is reduced, and because there is more time per shift to solve complex problems. Tuckman feels the longer shift has resulted in higher worker morale because there are fewer workdays, ten more weekends at home, a 20 percent lower commuting costs. Operations, maintenance, health physics staffs rotate on a common schedule to create a team spirit. Station staff people will soon be moving to the 12-hour shift (with the exception of QA/QC people.) Tuckman said regulators were worried at first about the change because of fears about operator alertness holding up for 12 hours at a time. He said the company has seen no sign of alertness problems so far and there have been no further comments from the regulators.

The 12-hour shift results in a few percent built-in overtime pay, said the manager, but overall overtime has been reduced because of improved productivity. A survey of initial emoloyee attitudes showed 80 percent interested in it. Now, said Tuckman, nearly 100 percent want to keep it, indicating high morale. " By every yardstick, improved employee morale, personnel errors, sickness, absenteeism, and callout overtime," said Tuckman, "we have seen benefits from the 12-hour shift rotation plan."

Summer peak demand to grow at 2.5% rate

SUMMER PEAK DEMAND – MW					
Region	Actual 1983	1984	1988	1993	Average Annual Growth (%) 1984-1993
ECAR	65,959	64,008	71,438	79,110	2.4
ERCOT	34,972	36,841	43,031	52,407	4.0
MAAC	34,783	34,720	36,690	39,150	1.3
MAIN	34,704	34,119	36,874	40,165	1.8
MAPP–U.S.	20,785	21,517	23,907	26,728	2.4
NPCC–U.S.	37,627	37,881	40,306	44,006	1.7
SERC	97,235	93,920	106,777	121,873	2.9
SPP	45,881	46,441	51,480	58,970	2.7
WSCC–U.S.	75,580	77,234	86,429	96,961	2.6
NERC–U.S.	447,526	446,681	496,968	559,370	2.5

SOURCE: North American Electric Reliability Council

PRINCETON, NJ—Over the next decade summer peak demand in the U.S. will increase at an annual rate of 2.5 percent, according to the North American Electric Reliability Council (NERC).

NERC said it estimates that summer peak demand will be 446,681 MW this year, compared to 447,526 MW in 1983. The summer peak demand will steadily rise over the next several years hitting 559,370 MW in 1993, said NERC.

The council released selected data in advance of publication of its *Electric Power Supply & Demand 1984-1993* forecast that will be out later this summer. NERC compiles its information from statistics submitted by individual utility members of each of NERC's nine regional councils.

NERC reports that the highest average summer peak demand growth rate will be in the Electric Reliability Council of Texas (ERCOT) region, with a four percent rate.

Summer peak demand is expected to increase only 1.7 percent a year in the Mid-Atlantic Area Council (MAAC) region, which includes portions of Pennsylvania, New Jersey, Maryland and Delaware.

In Canada, summer peak demand is expected to grow at a 3 percent annual rate over the next ten years. NERC said that Canada's 1984 summer peak should be 41,349 MW, compared to 41,014 last year.

U.S. energy sales are expected to increase at an annual rate of 2.7 percent over the next decade, according to NERC. Energy sales will be 2.39 billion MWH in 1984, compared to 2.34 billion MWH in 1983.

The highest growth rate in energy sales will occur in the ERCOT region (4.0 percent), while the lowest (1.8 percent) will be in the MAAC region, according to the NERC data.

Energy sales in Canada over the next ten years are expected to grow at an annual rate of 3.1 percent.

R&D funding not adequate, says Gray

BOSTON—Research and development funding by the electric utility industry is "completely inadequate", according to Massachusetts Institute of Technology President Paul E. Gray.

"Today the research and development efforts of the electric power industry can best be described as disaggregated, episodic and ad hoc," said MIT's Gray.

In a speech presented at the recent annual convention of the Edison Electric Institute, Gray said the R&D efforts of the Electric Power Research Institute don't address issues and problems posed by the coming decades. He said EPRI's current budget of $264 million is not enough.

"Your industry had total revenues last year of $130 billion and represents an in-place capital investment of $345 billion," pointed out Gray. "Even the short term requirements of the industry cannot be met with a research program of $300 million per year—and the longer term needs are simply not addressed in such programs."

The MIT president reminded convention attendees that the electric industry has developed some of the world's most sophisticated and reliable technology. He said the past record of development must be continued at an accelerated pace.

"The challenge," he said, "is to develop a program of basic research and development that can look to the long run needs of the industry, a program that calls on basic engineering sciences to identify and develop the technologies required by the electric power industries for 1995 and beyond."

Gray said it is time to invest in the future.

R&D areas

There are many areas in which new technological developments should make it possible for the utility industry to overcome the problem of acid rain, according to Gray.

Also, he said continued improvements in photovoltaic solar cells will eventually lead to economic solar electric systems for residential and other low-intensity consumers.

"Perhaps the most important area in which fundamental research is needed is in nuclear fission," said Gray. "As we understand the effects of burning coal, particularly the potentially devastating effects on weather patterns caused by increasing carbon dioxide in the atmosphere, our choice of courses for electric energy becomes increasingly limited."

Gray stated that he was convinced that nuclear power "in a new and politically acceptable form" must continue as a source of electric energy and heat.

Massachusetts Institute of Technology President Paul E. Gray says electric industry research and development efforts are "completely inadequate."

Energy innovator awards given to six by APPA

BOSTON—Six consumer-owned electric utilities have been honored by the American Public Power Association for their use of creative energy-efficient techniques and technologies.

The APPA Energy Innovator Award was given to the City of Austin (TX) Electric Utility, Fort Collins (CO) Light and Power, Nashville (TN) Electric Service, City of Palo Alto (CA) Utilities Dept., City of Livingston (MT) and the Sacramento (CA) Municipal Utility District.

The awards are presented through APPA's Demonstration of Energy-Efficient Developments program. Thirteen judges evaluated each entry on the basis of creativity, resource efficiency, benefits to consumers and transferability.

Austin said it plans to reduce its future energy demand by 535 MW through energy management and renewable energy programs.

Fort Collins was honored for its broad program that covers utility operation practices, customer service and educational outreach, community energy assistance and planning.

Under Nashville's Project 2000, high school students provided home repair and weatherization services to low-income, elderly and disabled citizens in 500 homes.

Palo Alto was given an award for its innovative use of a microcomputer.

NARUC supports regional regulation

WASHINGTON, D.C.—During a late June congressional hearing, Iowa Commerce Commission Chairman Andrew Varley urged passage of legislation that would allow states to enter into regional electric utility compacts.

He said that "a voluntary regional framework (for electric utility regulation) will provide state (regulators) the opportunity to evaluate their decisions on a broader scope to ensure that the energy needs of the consumer are met."

Varley, who serves as chairman of the National Association of Regulatory Utility Commissioners (NARUC) electricity committee, told the House subcommittee on energy conservation and power that H.R. 5766 also would shift Federal Energy Regulatory Commission (FERC) jurisdiction over intrastate wholesale power transactions to the states.

NARUC had endorsed a 1983 National Governor's Association report that said states should have the ultimate regulatory authority.

Speaking on behalf of NARUC, Varley said regional energy planning would facilitate the gathering and evaluating of information on the current and future needs and resource characteristic of a particular region.

"This would assist state regulators in developing long-range electric system and conservation plans, in avoiding inconsistent or conflicting regulatory policies and in reacting to emergency situations," he told the committee.

Varley testified that regional cooperation might encourage energy conservation by forcing utilities to make the most efficient use of the generation available in their region.

He recommended that regional planning be implemented on a voluntary basis in order to avoid adding another layer of regulation and to make sure planning decisions are approved by the state regulatory agencies.

A provision of the bill to return the power to regulate intrastate wholesale transactions back to the states received a strong endorsement from NARUC.

Varley said, "This would allow greater coordination of the regulation of intrastate wholesale rates with the regulation of revenues from retail rates currently under state jurisdiction."

NARUC publishes survey on utility regulation bills

WASHINGTON, D.C.—If enacted, a variety of proposals that are pending in different state legislatures could have a significant impact on the future of public utility regulation, according to a new survey.

The National Association of Regulatory Utility Commissioners (NARUC) *Survey of Pending State Legislation pertaining to Utility Regulation* lists bills which have been introduced in seventeen different categories of utility regulation.

NARUC says that at least twelve states currently are considering measures to require the direct election of commissioners.

In addition, the survey lists bills under consideration to restrict the use of automatic fuel adjustment clauses, impede the construction of nuclear plants and establish rules on utility disconnection procedures.

Copies of the 53-page survey may be obtained by sending $6.50 to NARUC, P.O. Box 684, Washington, D.C. 20044.

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